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EXAMINER	
LAROSE, COLIN M	
ART UNIT	**PAPER NUMBER**
2623	

DATE MAILED: 01/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/877,002	CHEN ET AL.	
	Examiner	Art Unit	
	Colin M. LaRose	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 August 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-42* is/are pending in the application.

4a) Of the above claim(s) *17-22,28,29 and 39-42* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,15 and 23-27* is/are rejected.

7)☒ Claim(s) *5,7-14,16 and 30-38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0701, 0601*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I in the reply filed on 13 August 2004 is acknowledged. The traversal is on the ground(s) that "a thorough search for the subject matter of any one Group of claims would encompass a search for the subject matter of the remaining claims." This is not found persuasive because Group I and Group II are subcombinations containing distinct limitations that do require different searches. For example, claim 1 comprises an interpolation value calculation section that includes calculating a local average and local curvature for interpolating a missing color component. In contrast, claim 17 comprises a hue value calculation section that calculates hue values near a target pixel using luminance and color component values, a hue value interpolation section that interpolates a hue value at the target pixel, and a color conversion section that interpolates a color component at the target pixel from the hue value using the luminance component value.

It is evident that a search for the subject matter of claim 1 (Group I) would not encompass a search for claim 17 (Group II). The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-4 and 23-25 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,075,889 by Hamilton, Jr. et al. ("Hamilton").

Regarding claim 1, Hamilton discloses an interpolation processing apparatus (figure 2) that engages in processing on image data which are provided in a colorimetric system constituted of first~nth (n>=2) color components and include color information corresponding to a single color component provided at each pixel (i.e. Hamilton processes RGB pixel data that has been captured using a color filter array pattern such as the Bayer pattern) to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section (32) that uses color information at pixels located in a local area containing an interpolation target pixel (e.g. target pixel at position A_{33}) to undergo interpolation processing to calculate an interpolation value including, at least

(1) local average information of the first color component with regard to the interpolation target pixel (column 5, lines 20-44: a local average B_{33} corresponding to the target pixel A_{33} is computed) and

(2) local curvature information corresponding to at least two color components with regard to the interpolation target pixel (column 5, line 45 through column 6, line 65: local

curvature information, including "horz", "vert", are calculated; these curvature values determine the "flatness" of the target pixel).

Regarding claim 2, Hamilton discloses an interpolation processing apparatus according to claim 1, wherein:

said interpolation value calculation section calculates, as said local curvature information corresponding to at least two color components,

(1) local curvature information based upon a color component matching a color component at the interpolation target pixel (i.e. Hamilton's local curvature information ("horz" and "vert") is based on a color component at the target pixel A_{33}) and

(2) local curvature information based upon a color component other than the color component at the interpolation target pixel (i.e. Hamilton's local curvature information ("horz" and "vert") is based on a color component other than the one at the target pixel A_{33}).

Regarding claim 3, Hamilton discloses an interpolation processing apparatus (figure 2) that engages in processing on image data which are provided in a colorimetric system constituted of first~nth (n>=2) color components and include color information corresponding to a single color component provided at each pixel (i.e. Hamilton processes RGB pixel data that has been captured using a color filter array pattern such as the Bayer pattern) to determine an interpolation

value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section (32) that uses color information at pixels located in a local area containing an interpolation target pixel (e.g. target pixel at position A_{33}) to undergo interpolation processing to calculate an interpolation value including, at least

(1) local average information of the first color component with regard to the interpolation target pixel (column 5, lines 20-44: a local average B_{33} corresponding to the target pixel A_{33} is computed) and

(2) local curvature information based upon a color component other than a color component at the interpolation target pixel (column 5, line 45 through column 6, line 65: local curvature information, including "horz", "vert", are calculated; these curvature values determine the "flatness" of the target pixel).

Regarding claim 4, Hamilton discloses an interpolation processing apparatus (figure 2) that engages in processing on image data which are provided in a calorimetric system constituted of first~nth (n>=2) color components and include color information corresponding to a single color component provided at each pixel (i.e. Hamilton processes RGB pixel data that has been captured using a color filter array pattern such as the Bayer pattern) to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section (32) that uses color information at pixels located in a local area containing an interpolation target pixel (e.g. target pixel at position A_{33}) to undergo interpolation processing to calculate an interpolation value including, at least

(1) local average information of the first color component with regard to the interpolation target pixel (column 5, lines 20-44: a local average B_{33} corresponding to the target pixel A_{33} is computed) and

(2) local curvature information corresponding to the first color component with respect to the interpolation target pixel (column 5, line 45 through column 6, line 65: local curvature information, including "horz", "vert", are calculated; these curvature values determine the "flatness" of the target pixel).

Regarding claim 23, Hamilton discloses a recording medium (figure 2) having recorded therein an interpolation processing program (column 9, lines 36-40) to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first~nth (n>=2) color components with color information corresponding to a single color component present at each pixel (i.e. Hamilton processes RGB pixel data that has been captured using a color filter array pattern such as the Bayer pattern), said interpolation processing program comprising:

an interpolation value calculation step (32) in which an interpolation value including, at least

(1) local average information of the first color component with regard to an interpolation target pixel to undergo interpolation processing (column 5, lines 20-44: a local average B_{33} corresponding to the target pixel A_{33} is computed) and

(2) local curvature information corresponding to at least two color components with regard to the interpolation target pixel (column 5, line 45 through column 6, line 65: local curvature information, including "horz", "vert", are calculated; these curvature values determine the "flatness" of the target pixel), is calculated by using color information provided at pixels set within a local area containing the interpolation target pixel.

Regarding claim 24, Hamilton discloses a recording medium (figure 2) having recorded therein an interpolation processing program (column 9, lines 36-40) to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first~nth (n>=2) color components with color information corresponding to a single color component present at each pixel (i.e. Hamilton processes RGB pixel data that has been captured using a color filter array pattern such as the Bayer pattern), said interpolation processing program comprising:

an interpolation value calculation step (32) in which an interpolation value including, at least

(1) local average information of the first color component with regard to an interpolation target pixel to undergo the interpolation processing (column 5, lines 20-44: a local average B_{33} corresponding to the target pixel A_{33} is computed); and

(2) local curvature information based upon a color component other than a color component at the interpolation target pixel (column 5, line 45 through column 6, line 65: local curvature information, including "horz", "vert", are calculated; these curvature values determine the "flatness" of the target pixel), is calculated by using color information provided at pixels set within a local area containing the interpolation target pixel.

Regarding claim 25, Hamilton discloses a recording medium (figure 2) having recorded therein an interpolation processing program (column 9, lines 36-40) to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a calorimetric system constituted of first~nth (n>=2) color components with color information corresponding to a single color component present at each pixel (i.e. Hamilton processes RGB pixel data that has been captured using a color filter array pattern such as the Bayer pattern), said interpolation processing program comprising:

an interpolation value calculation step (32) in which an interpolation value including, at least

(1) local average information of the first color component with regard to an interpolation target pixel to undergo the interpolation processing (column 5, lines 20-44: a local average B_{33} corresponding to the target pixel A_{33} is computed), and

(2) local curvature information corresponding to the first color component with respect to the interpolation target pixel (column 5, line 45 through column 6, line 65: local curvature information, including "horz", "vert", are calculated; these curvature values determine the

"flatness" of the target pixel), is calculated by using color information provided at pixels set within a local area containing the interpolation target pixel.

4. Claims 6 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,744,916 by Takahashi.

Regarding claims 6 and 26, Takahashi discloses an interpolation processing apparatus/recording medium with a computer program (figure 1) that engages in processing on image data which are provided in a calorimetric system constituted of first~nth (n>=2) color components and include color information corresponding to a single color component provided at each pixel (e.g. the pixel area 101 is comprised of pixels c-j having a G component) to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing (i.e. the pixel "x"), comprising:

an interpolation value calculation section (figure 3) that calculates an interpolation value including at least two terms, i.e., a first term ("S(d+i)") and a second term ("T(f+g)") by using color information at pixels set in a local area containing an interpolation target pixel to undergo interpolation processing;

a first similarity judgment section (minimum value 307) that judges degrees of similarity to the interpolation target pixel along at least two directions in which pixels having color information corresponding to the first color component are connected to the interpolation target pixel (i.e. the minimum value block 307 compares the output of blocks 301 and 303, both of

which calculate the absolute value of differences among pixels c through j in two different horizontal directions around the interpolation pixel, to determine the outputs' "degree of similarity"); and

a second similarity judgment section (minimum value 308) that judges degrees of similarity to the interpolation target pixel along at least two directions other than the directions in which the degrees of similarity are judged by said first similarity judgment section (i.e. the minimum value block 308 compares the output of blocks 302 and 304, both of which calculate the absolute value of differences among pixels c through j in two different vertical directions around the interpolation pixel, to determine the outputs' "degree of similarity"), wherein:

said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said first term are set based upon results of a judgment made by said first similarity judgment section (i.e. the minimum value block 307 selects a horizontal direction having the minimum absolute value and uses at least that direction to calculate the first term) and selects a direction along which pixels having color information to be used to calculate said second term are set based upon results of a judgment made by said second similarity judgment section (i.e. the minimum value block 308 selects a vertical direction having the minimum absolute value and uses at least that direction to calculate the second term).

5. Claims 15 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,805,217 by Lu et al. ("Lu").

Regarding claims 15 and 27, Lu discloses an interpolation processing apparatus/recording medium having a computer program (figure 1) that engages in processing on image data which are provided in a calorimetric system constituted of first~nth (n>=2) color components and include color information corresponding to a single color component provided at each pixel to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

a first term calculation section (interpolation processor 36) that calculates a first term representing average information of the first color component with regard to an interpolation target pixel to undergo interpolation processing by using color information corresponding to color components at pixels set in a local area containing the interpolation target pixel (column 5, lines 55-59: "$(G_{preceeding} + G_{following}) / 2$" is a first term that represents average information);

a second term calculation section (interpolation processor 36) that calculates a second term representing local curvature information based upon a color component matching the color component at the interpolation target pixel with regard to the interpolation target pixel by using color information corresponding to color components at pixels set in a local area containing the interpolation target pixel (column 5, lines 55-59: "$(2B_0 - B_{-2} - B_2) / 2$" is a second term that represents local curvature information); and

an interpolation value calculation section (interpolation processor 36) that calculates an interpolation value by adding said second term multiplied by a weighting coefficient constituted of color information corresponding to a plurality of color components at pixels in the local area containing the interpolation target pixel to said first term (column 5, lines 55-59: the

interpolation value G is calculated by adding the first term to the second term multiplied by weighting coefficient σ).

Allowable Subject Matter

6. Claims 5, 7-14, 16, and 30-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claims 5, 30, and 38, Hamilton does not disclose first and second similarity judgment sections that each judge degrees of similarity ... along at least two directions; Hamilton also does not disclose an interpolation value calculation section that (1) selects a direction ... to be used to calculate the local average information; (2) selects a direction used to calculate local curvature information based on results of the first similarity judgment section; and (3) selects a direction used to calculate local curvature information based on results of the second similarity judgment section.

Regarding claim 7, Takahashi does nptdisclose that the first term contains local average information and local curvature information, as claimed, and that the second term contains local curvature information constituted of a single color component and manifesting directionality, as claimed. Rather, each of Takahashi's terms is the coefficient S or T multiplied by the sum of surrounding pixels.

Regarding claim 16, Lu does not disclose ascertaining inclinations of the color information along a predetermined direction and then calculating the weighting coefficient in

accordance with a correlation among the inclinations, as claimed. Lu does not appear to disclose how the weighting coefficient σ is calculated.

Claims 8-14, and 31-37 depend from claims 5, 7, 16, 30, and 38, either directly or indirectly.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 6,091,862 by Okisu

U.S. Patent 6,130,960 by Acharya

U.S. Patent 5,805,216 by Tabei et al

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colin M. LaRose whose telephone number is (703) 306-3489. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au, can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2600 Customer Service Office whose telephone number is (703) 306-0377.

CML

Group Art Unit 2623

21 January 2005

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